



**WebSphere** software

## **Extending enterprise applications to mobile users.**

**WebSphere Everyplace Access**

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## Introduction

Mobile computing is rising to the top of the strategic investment list within many enterprises. These enterprises see the competitive advantage to a mobile computing business that includes mobilizing their existing enterprise applications and implementing new mobile applications. They understand mobile workers need access to office services, such as e-mail and calendars, and access to vital enterprise information. And equally important the enterprise must be able to communicate information to its mobile employees as the need arises.

As an enterprise your business must be up and running quickly with a solution that delivers return on investment (ROI) within your time frame and demonstrates the value of mobile business immediately. To accomplish this, you need to establish a strategy that shows how your business will become mobilized. To succeed you need the right support structure which includes:

- *A runtime environment that integrates with your existing infrastructure and business applications*
- *Where possible, packaged solutions that deliver functions from day one*
- *Integrated tools to enable your development team to mobilize existing enterprise assets, including the tools as samples and examples for developers to use to help build your solution*
- *Easy-to-deploy solutions that are based on open-standard technologies to protect your investments in the technology*
- *A flexible, extensible environment that can help ensure your investment in mobile computing commerce grows with you as your needs change and expand*

This white paper is intended for mobile application solution architects and developers and discusses many key points about building mobile applications for the enterprise. It introduces IBM WebSphere® Everyplace™ Access and the capabilities it provides to help build and run mobile computing solutions. It also explains the value of creating an enterprise mobilization strategy and how to take advantage of mobile computing technology to help increase your mobile work force productivity.

IBM understands the need to leverage your existing information technology (IT) assets, the desire to attain expertise in new technologies and the necessity to create solutions with long-term benefits for your business. WebSphere Everyplace Access provides an architecture that can minimize your risks and provides the IT technology necessary to mobilize your enterprise. Using IBM tools, your development team can leverage many of the samples and examples to build extensions to your applications or create new applications. IBM wants to be your trading partner and to help you develop mobile computing applications by leveraging its products and expertise in this exciting technology.

### **Mobile applications are a competitive necessity**

New mobile computing devices (also known as pervasive or hand-held devices) are appearing everywhere. While in an airport, your neighbor may be exchanging messages with colleagues or loved ones. The U.S. House of Representatives is using mobile computing devices to stay connected to events occurring on the House floor and other areas of government. Stock trading floors across the world are using these same technologies for realtime business event and stock transaction notifications. Corporations are arming their sales forces and field service agents with mobile computing devices to help them minimize paperwork and make corporate data available at their finger tips. If people in government, industry and everyday life are using mobile computing technology, you can be sure your competition is using it too.

We live in a fast-paced world that is easily serviced from an office because of ready access to information, people and applications. But the workplace is changing. Conducting business these days requires more and more employees to be mobile. Executives, consultants, field service personnel and sales people have always traveled as part of their jobs. Many of these mobile workers must return to their offices to do paperwork, including submitting time sheets, obtaining information to meet customer requests, placing and updating orders and submitting expense reports. To work effectively these people need access to the same services provided at the office while they are away. This is accomplished by extending various enterprise applications and services to the mobile environment. By allowing these people to remain mobile and still have access to enterprise applications, they can focus on their core activities, decrease downtime and ultimately create a return on investment.

Achieving a competitive advantage requires skillful use of technology, weighing risk and seizing opportunity. IBM has the products to help you minimize the risks and seize the opportunity. Providing reliable, robust technology for the enterprise has always been a strong suit of IBM. IBM is here to help you take the competitive advantage.

### **Mobilizing an enterprise application**

Mobilizing an enterprise application depends on the characteristics of the existing application. Its makeup will affect the time and effort required to create, test and deploy a mobile business application. The characteristics of the application being mobilized, the target mobile devices, the skills of the development team and the needs and skills of the end users have powerful effects on the project. Here are three possible scenarios that illustrate this:

- *Scenario 1.* Let's assume the target application is a traditional client/server transaction-based application that the company does not want to change. In this situation, the best approach may be to build a wrapper around the existing application, allowing the application to continue to function as always. The wrapper takes on the responsibility of interactions with mobile users and passes data to the existing system the same way it receives data today. This interaction can be a complex undertaking because of intricacies in the existing application and the needs of the mobile environment.
- *Scenario 2.* You could choose to bypass the application and interact directly with the data instead of creating a wrapper. In this case, mechanisms are used to access the data, adapt the data to the mobile device and help ensure the data exchanged between the device and the server is kept synchronized. This requires a mechanism to synchronize the data between the mobile device and the data server and capabilities on the device to display and manage the data.
- *Scenario 3.* Another choice is to extend an e-business application (Web enabled) to mobile devices. In this case, the effort to mobilize the application should be simpler because the application already supports an open interaction model. Extending this application to mobile devices involves adapting the content and helping to ensure the data exchanged between the two environments is synchronized properly.

These scenarios depict real-world considerations for mobilizing an application. Because each scenario has its own set of issues that affect the amount of time and effort required for creating a mobile application, the solution architecture will be tailored to the characteristics of the existing application and the desired outcome.

### **WebSphere Everyplace Access mobile computing features**

Enterprises typically have a very rich computing environment served by a variety of applications. These can include internally developed applications, IBM Business Partner packages and a mix of software products tuned to service specific needs within the enterprise or e-mail and personal information management (PIM) applications. Any of these enterprise applications are candidates for mobile business. The WebSphere Everyplace Access computing platform can bridge the existing enterprise application environment with the mobile computing needs of enterprise employees or customers. WebSphere Everyplace Access provides the following services that enable an enterprise to mobilize quickly and easily.

#### Synchronization services

Synchronization services support synchronization of e-mail, PIM applications and business data between a mobile device and the server. The synchronization component, called Everyplace synchronization server, uses synchronization technology (open standard SyncML technology for e-mail and PIM applications) to coordinate the information between the mobile device and the back-end data store. Content that can be synchronized includes:

- *E-mail and PIM that synchronizes both IBM Lotus Notes® and Microsoft® Exchange 2000 data*
- *IBM Lotus® Domino™ databases through IBM Lotus Domino Everyplace Enterprise Server*
- *Java Database Connectivity (JDBC™) technology-compliant databases using IBM DB2® Everyplace*

### Content adaptation services

Content adaptation services utilize transcoding technology that supports content conversion to target device markup languages. These services enable dynamic adaptation of Web and application content to a format appropriate for the mobile device. Two aspects of content adaptation are:

- *Automated content conversion, which uses transcoding techniques to automatically determine the content transformation needs for the target device and dynamically transforms the content as it is delivered to the device (based on the capabilities of the device).*
- *Managed content conversion, which uses the results of the text clipping portlet (through instructions created by the developers) and transforms the content into an acceptable format for the mobile device. IBM WebSphere Everyplace Toolkit contains content adaptation and text clipping tools.*

When needed, fragmentation services are used to automate the splitting of content into smaller units (decks) and management of the delivery of this content to the devices.

### Prepackaged portlet applications

Prepackaged portlet applications are applications commonly used by mobile workers, including:

- *Banner advertisement for preferred banner text*
- *Bookmarks of favorite Web sites*
- *Clipping Selection from Web sites*
- *Directory Search - LDAP search*
- *Lotus Notes Calendar, Address book, E-mail, To do and Journal*
- *Microsoft Exchange E-mail, Calendar, Contacts, Task and Memo*
- *MoreOver News headline compilation*
- *Post Office Protocol3 (POP3) and Internet Message Access Protocol4 (IMAP4) e-mail*
- *Reminders*
- *World Clock*

### Offline Web content browsing

Offline Web content browsing provides the ability to select Web content that is sent to the device. This content can be refreshed as needed by the user when the user connects to the enterprise server. While disconnected from the server the user can view the Web content when using the device.

### Common services

Common services include basic services like user identification and authorization services, administration services and customization services. For example:

- *Authentication and authorization services help ensure the corporate assets are protected.*
- *Single sign-on support allows a user to sign-on once to access enabled applications and services.*
- *Device-managing services help ensure mobile devices are at current software release level and provide configuration and software updates for mobile devices.*
- *Directory services allow plugging in to any of these directory services (IBM Tivoli® SecureWay® Directory, Lotus Domino, iPlanet Directory Server, Microsoft Active Directory).*

### IBM WebSphere Everyplace Toolkit

IBM WebSphere Everyplace Toolkit is a set of tools built as a plug-in to the integrated development environment, using the open Eclipse framework, IBM WebSphere Studio provides an end-to-end application development environment. Everyplace Toolkit extends this development environment and enables application developers to create new mobile applications or to extend existing enterprise applications into the mobile environment. Everyplace Toolkit includes:

- *Portal and portlet integrated development environment (IDE) capabilities to create, test, debug and deploy individual portlets and Web content*
- *Content creation and adaptation tools that provide device mark-up editors to create content in various mark-up languages*
- *External Annotation Editor (may be provided in the future) that clips and reformats Web content for mobile devices and creates annotation files used by content adapters*
- *Sample and example pervasive computing applications*
- *Synchronization tooling (may be provided in the future) to assist in the development of forms-based applications that focus on viewing and management of data*

### Client services

IBM WebSphere Everyplace Access provides many services essential to mobile computing. It provides the platform needed to build flexible, changeable and lasting applications. First, it offers a flexible base that manages change and minimizes the impact to the applications that rely on it. This infrastructure enables the ever-growing range of mobile devices and communication capabilities to be available, without major disruption to the business application and data. The WebSphere Everyplace Access environment also provides a common set of essential services for the mobile application that can be used across a variety of products. These services handle security and connectivity with the intent to shield the application developer from various runtime environment details. Security-rich features help ensure the enterprise environment is protected from assaults against it. Connectivity services handle the interaction between the client device and the enterprise. The WebSphere Everyplace Access platform-based architecture can minimize what the enterprise application must do to interact with the devices and the new environment.

### Creating a mobile application using WebSphere Everyplace Access

With WebSphere Everyplace Access, you can create a mobile application by looking at the existing Web model that does not yet support mobile computing. The Web model includes Web servers, Web browsers and technologies that use Java™, Hypertext Markup Language (HTML), Extensible Markup Language (XML) and Internet protocols. Solutions implemented using this Web model consist of components that enable Web applications to interact with existing enterprise assets, as shown in Figure 1.

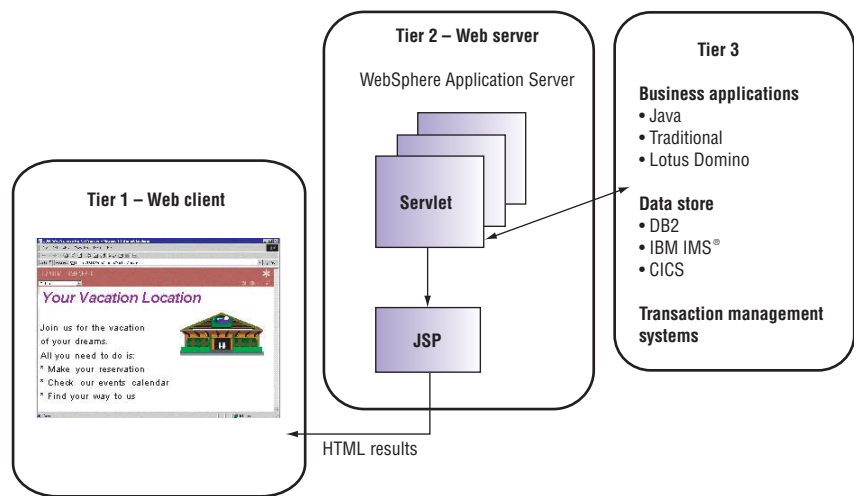


Figure 1. Web model



This multitier Web model offers flexibility and has the capability to extend both a Web environment and an enterprise environment. To increase the reach into an enterprise, connectors and dynamic content generators are used that consist of Java™ servlets and JavaServer Pages (JSP) or other scripting technology. JSP allows splitting content generation from content presentation. This model has facilitated mobile computing by providing clear separation of content from processing logic. Many characteristics of the Web model work well with the mobile computing model. However, some differences are shown in Figure 2.

<b>Characteristics for</b>	<b>Simple Web model (browser-based) connectivity</b>	<b>Mobile computing model</b>
End-user device	Known capabilities and characteristics	Multiple devices (diverse modalities, capabilities and characteristics)
	Standard input mechanisms (keyboard and mouse)	Diverse input mechanisms (keyboard, pen, visual readers, verbal)
	Fixed, static location	Dynamic location
Connection	Continuous availability	Intermittent availability
	High bandwidth	Low bandwidth
	Low latency	High latency
Browser	Limited number of browsers	Diverse browser capabilities
	User information stored by cookies	Unreliable or unavailable cookies
	Limited local storage or compute power	Various amounts of local storage and compute power
Interaction model	Available pull model for users to request information	Available pull-and-push model
User experience	Standard across devices	Unique to each device

Figure 2. Web model and mobile computing model comparison

Using a browser on a mobile device provides the same basic qualities (Web browsing) as the Web model previously described. WebSphere Everyplace Access supports the Web model on the mobile device and, more important, supports many other capabilities that are required by robust mobile applications.

WebSphere Everyplace Access extends and enhances the Web model and its many variants to support mobile computing for the enterprise as shown in Figure 3. It incorporates IBM WebSphere Application Server and provides the services necessary to connect the mobile device to the enterprise.

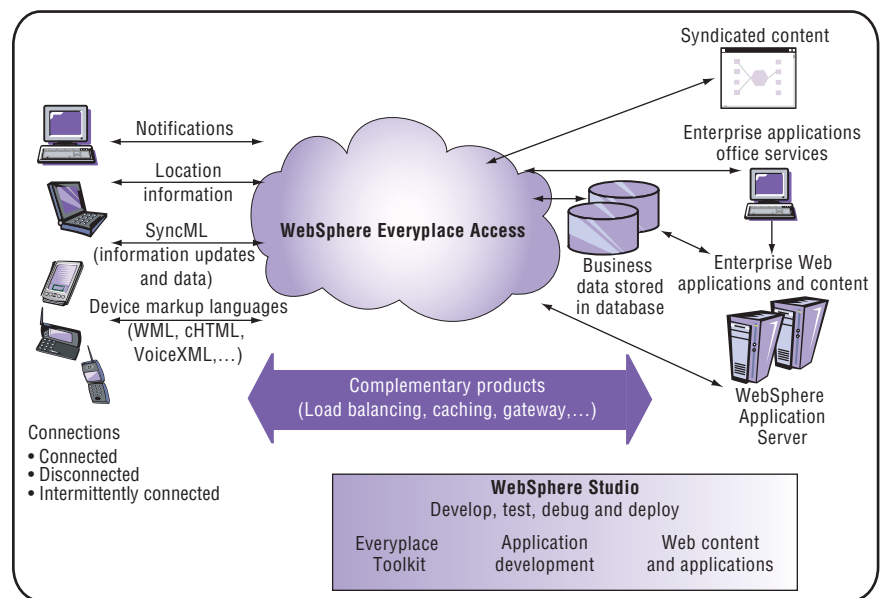


Figure 3. WebSphere Everyplace Access Model

WebSphere Application Server supports an application model containing servlets, JSP and Java. WebSphere Everyplace Access application model extends this approach by utilizing industry-standard technology within the IBM WebSphere Portal family, and supports portlets. Portlets, a subclass of the HTTP servlet class, are small Web applications typically seen as a frame or box within a Web page or portal. Portals provide an aggregation point for diverse applications and information. WebSphere Everyplace Access leverages this approach and extends it to mobile devices. It provides an integration point between the mobile application and your existing environment. Portlets can be self-sufficient, interact with other resources or access external data sources. The portlet application programming interface (API) has properties that enable it to simply plug into WebSphere Everyplace Access or WebSphere Portal.

So how do you extend your existing enterprise applications to mobile devices? Your application architects and developers are the implementers of your enterprise mobilization strategy. With WebSphere Everyplace Access, Everyplace Toolkit and WebSphere Studio, the development team can more easily and efficiently carry out your strategy. WebSphere Everyplace Access provides the services –briefly described in the previous section– to allow you to mobilize an enterprise application. Like the WebSphere Application Server shown in the Web model, it provides the middleware and services necessary to help transform your enterprise into a mobile computing business. For example, providing e-mail and PIM access to your enterprise for your mobile workers is part of WebSphere Everyplace Access. After installing the software on your server and client devices and performing user administration activities, you can have your mobile workers using e-mail and accessing PIM applications in a very short time. Even performing offline Web content browsing is simply a matter of setting up the devices and the server to communicate and then enabling users to request Web content from their devices. With WebSphere Everyplace Access, developers can:

- *Adapt existing content to mobile devices and connection capabilities, or content adaptation.*
- *Exchange and synchronize data between the enterprise and the device, or data synchronization.*
- *Customize the user experience.*

### Content adaptation

In the mobile computing world reuse is popular because it saves time and energy by extending or expanding the use of existing information and data to mobile devices. Reuse can be accomplished by content adaptation provided through transcoding technology. Information (for example, Web content) in its existing form is transformed to the format appropriate for mobile devices. The wide range of devices, technologies and communication channels has created a variety of optimized data formats. Each type of device can have a different monitor with varying screen size, capabilities (graphics, color and so on) and shapes. Consequently, a different amount of content can be displayed on any given device.

Transcoding technology allows you to select information and make it available in a customized fashion to mobile users. For example, a discrete subset of information, such as stock prices, can be selected, formatted and sent to a device (or accessed through a browser), which could then be used by a trader on the trading floor. And, from this information base, even more company information and financial graphs could be provided to an industry analyst in a Web browser. In other words, transcoding technology is able to effectively filter and adapt content to the target mobile device using user and device preferences.

Most Web content today is represented in HTML; however, mobile devices can have their own markup languages. These device markup languages designed for content presentation include Wireless Markup Language (WML) from the Wireless Access Protocol (WAP) forum; compact HTML (cHTML) supported by a growing number of devices and used primarily for iMode in Japan; Extensible Hypertext Markup Language (XHTML) used on the Web and in WAP, Version 2. Text clipping can be used to select the Web content HTML that is targeted for the device, and transcoding technology performs the necessary transforms for that target device. IBM WebSphere Studio and Everyplace Toolkit External Annotation Editor can be used by a developer to perform text clipping of Web content. Annotation instructions are created from the clipping process and are used by transcoding technology to filter the content and create the desired device markup language.

Web content and business data can also be represented as XML documents. To transform XML documents into device markup languages, Extensible Stylesheet Language Transforms (XSLT) can be used. An XSLT file consists of transformation rules that are processed against the source XML document to create the target document. IBM intends to include an XSLT editor with WebSphere Studio to create XSLT transformation rules and an XSLT test tool to debug them. When an XSLT rules file is deployed to the runtime environment, transcoding technology performs the transformations.

Device markup language editors within Everyplace Toolkit allow you to create, edit and deploy device markup. To verify the markup, built-in previews or plug-in device emulators are used in WebSphere Studio, providing an integrated development environment for the developer. These tools allow the developers to customize the content for the device. However, the transcoding technology can be used as is without customization.

### Data synchronization

Many mobile devices are powerful enough to manage data and to execute and run applications. With the capacity of today's wireless networks, a mobile device may not always be capable of connecting and it may even be desirable to remain unconnected. Data created and used by applications on mobile devices must be kept synchronized with data on the enterprise servers. The data exchange (between the device and the server) is accomplished using synchronization. Everyplace synchronization server helps ensure data is exchanged successfully between the two environments and that data is kept synchronized. This synchronization process flows both ways, with data moving to and from the server and to and from the client. Everyplace synchronization server can be used to synchronize all types of information, such as business application data, e-mail and PIM application data.

E-mail and PIM applications are one source of information for mobile workers; however, to do their jobs they often need access to business data. For example, a sales representative could collect an order using a personal digital assistant (PDA) rather than filling out a paper form. The sales representative could then complete the order-entry process using an application that helps ensure accuracy because of data entered about the products contained on the device. At some point, the order on the client is synchronized with the server, using Everyplace synchronization server, and the order data is added to the order database. Applications like this can be created, tested and deployed using WebSphere Studio and Everyplace Toolkit.

SyncML is used to transport e-mail and PIM applications data in mobile applications. The SyncML standard is also in the process of being extended to formalize support for business data and device management considerations. Until it becomes an open industry standard, WebSphere Everyplace Access provides a format for the data. IBM plans to adopt the approved SyncML format for business data, once ratified.

### Customizing the user experience

The ultimate success of a mobile application is how well it fits a user's needs. Portals have enhanced the Web by giving a user an aggregated view of the information and applications within the enterprise. An added feature of portals is that they allow you to customize views of information and applica-

tions, which allows you to structure your view of the enterprise. Customization agents can be used to put particular information in order of priority. For example, an e-mail from your manager can receive a higher priority, or you can create a special alert to inform you of the e-mail. User needs must be considered to make the most of this technology, and customization is a critical aspect of meeting these needs.

### **Challenges and guidelines for mobile computing business development**

With publish and subscribe software you can increase the leverage of your company assets and extend the reach of your business by addressing the daily challenges of communicating with people and applications, and recognizing other technical concerns of IT groups.

WebSphere Everyplace Access provides a platform for mobile computing in the enterprise. However, the enterprise must overcome several challenges to mobilize its enterprise assets. Some of the challenges include:

- *Determining the architectural approach*
- *Dealing with the current application environment*
- *Securing connected networks*
- *Managing user sessions*
- *Ensuring a scalable runtime environment*
- *Managing diverse content*
- *Handling and managing client devices*

#### **Determining the architectural approach**

WebSphere Everyplace Access is designed to extend the traditional enterprise application environment to your mobile business. If an enterprise application has a Web extension, many of the connection points into the applications already exist. WebSphere Everyplace Access, like the Web model, is designed to minimize the impact on existing applications. WebSphere Everyplace Access can shield the application developer from details of the mobile environment if necessary. However, a business application occasionally requires details about the mobile device or the mobile environment. WebSphere Everyplace Access supports this by providing access through APIs to information about the device, the network and the connection. For example, an enterprise application may need to send a user an emergency message, and knowing that the user's device is connected to the network allows this transmission to proceed. The application can use WebSphere Everyplace Access APIs to find the user and send the information to the user.

### Working in today's application environment

Most companies typically have a large investment in their existing applications which drives the integration of new technology into today's application environment. Many existing applications have been extended to the Web, which fits nicely with the mobile computing model. The Web model promotes a paradigm where business logic resides on a server and requests are made of that server for information. The Web model can access the business data directly and interact with the business application.

WebSphere Everyplace Access can extend the Web model by introducing new ways to access information and interact with the existing application environment. A Web user or mobile device user can interact with the enterprise in three ways.

- *View.* View data that remains in the server domain. This method of access is used when the user can connect to the server.
- *Copy.* A new method of access, where the client has a copy of the information. The user can access, update and add information locally on the device. This information will be synchronized with the server when the device is connected with the server.
- *Move.* A third method of access where information is moved from one device to another device. Once the move is completed, the sending device no longer has the information.

WebSphere Everyplace Access services support the view, copy or move interaction paradigms. Viewing of Web content (browsing) can be accomplished by the mobile user while the device has connectivity to the server. WebSphere Everyplace Access also supports offline viewing of preselected content that has automatically been saved to the mobile device. Copy (synchronization) supports copying data from the server to the client device and allows later synchronizing of that information back to the server and then again out to the client. Move (notification or messaging) supports situations where data from the source environment (device or server) is sent to the target environment and then removed from the source environment. For example, notification provides services to support the inventory application in sending a notice to the purchasing agent's device when the item quantity drops below a predetermined minimum quantity. And once the message is successfully sent to the device, it is removed from the source system. Notification services will be part of a future release of WebSphere Everyplace Access.

### Securing connected networks

End-to-end security is affected when you extend the scope of the connections to a mobile device because they are made through network providers. There are a variety of ways to provide security within an environment. This paper will not go into detail on this topic. WebSphere Everyplace Access provides a Secure Sockets Layer (SSL) solution sufficient for most situations. If security requirements exceed those provided by SSL, the enterprise can use virtual private network (VPN) with a mobile application based on WebSphere Everyplace Access. User authentication and authorization are other aspects of providing a security-rich environment. In most cases determining a user's identity requires the following:

- *Verifying the user's identity (authentication)*
- *Input and output access policies and management (authorization and single sign-on)*
- *Selection of group and individual services (user profiles)*

This level of security is managed by authentication and authorization services within WebSphere Everyplace Access.

IBM WebSphere Everyplace Client provides a client-side authentication proxy that allows data to be transferred between the client and server using SSL. WebSphere Everyplace Client security enables security-rich data transfer for offline portal browsing, PIM, e-mail and database synchronization.

Various means to help secure access to the device are becoming available. One method would be to have the user provide a user identification and password to access the applications on the device. If this capability is not available, user authentication and authorization are even more critical for the enterprise.

Security will continue to evolve as the technology options change. Generalized Packet Radio Services (GPRS), found on packet-based wireless devices, is a network type that is becoming more widely available. In effect, these devices are always on, and the user is potentially more vulnerable to security exposures. The initial authentication process just discussed is now handled by the GPRS network operator. The mobile solution may need to use this external authentication that is tightly linked into the enterprise solution, or gain access to the operator authentication process and provide it with the enterprise.



### Managing user sessions

A mobile business application often employs the concept of a session. For example, a user logs on to a banking application, checks an account balance and then decides to transfer funds between accounts. The session holds the information across these three actions. The Web, however, uses a stateless technology (HTTP) in which each action in a session has no knowledge of the previous one. This is not acceptable in many situations. Several methods can be used to work around stateless technology, but the most common solution is to use a cookie. Other methods include Web server authentication, hidden fields or Internet address (URL) rewriting.

WebSphere Everyplace Access supports the use of URL rewriting to provide the most reliable method of ensuring that session information remains valid. This approach is highly scalable when used across load-balancing schemes because the transaction route can be dynamically switched across various proxies and servers. This approach can be supplemented at application level by using additional session information methods, but the developer should be aware of constraints with these methods.

For instance, authentication requires a user name and password to be entered every time the site is entered. And entering this information by telephone can be difficult. Hidden fields can only be used to hold session identifiers for dynamically generated forms so an application that has static form data, or mixed static and dynamic form data, cannot use this method.

Cookies have become a security concern in the Web-browser world. In addition, cookies are often turned off. A developer must keep in mind that the client browser may not support cookies, the connecting gateway may not support cookies or cookies may be turned off.

The WAP specification has optional support for cookies in some of its newer versions, so older devices may not support cookies. And in the latest WAP specifications, only limited support is found (at least four cookies of 125 bytes each) because of device constraints. The amount of data transmission capability required for cookies needs to be considered because on a wireless connection, the user is paying for either the amount of data transmitted or the amount of time it takes to transmit the data. Variations on the traditional cookie model include those in which a server side cookie spoofs or holds device cookies on

behalf of a device. This variation overcomes some limitations of cookies but it is far from universally supported and may make the application less portable. Even after addressing these technical issues, there may be legal considerations. In Europe, for example, legislation on privacy has been submitted to the European Parliament about how cookies are used, including how they contain information on behalf of a user without specific and notified permission given, as well as the ability of the user to access and correct any incorrect information.

The developer has various ways to solve this problem and the solutions will reflect the particular situation. As time goes on, technology will come to grips with this issue. But for now, it is in the developer's hands.

#### Ensuring a scalable runtime environment

Because of the complexity of establishing and ending connections on various wireless network solutions, some enterprises choose to subcontract their wireless wide area networks (WANs). These enterprises expect the provider to feed them a secured connection, which ends up separating the application from the connection information available within the gateway or authentication server (for example, radius). For mobile telephones this may be the last point in the system associated with a user's telephone number. These connections are usually behind a firewall, so the application must be designed to establish and maintain addressing information through a firewall. IBM WebSphere Everyplace Wireless Gateway was designed to address this challenge. WebSphere Everyplace Wireless Gateway has the ability to use internal or external authentication processes that can be presented in various enterprise configurations.

Expanding the enterprise for mobile business also means supporting the demands of a larger number of users. This problem has been addressed through load balancing and caching (using IBM WebSphere Edge Server). Increasing the number of servers supplying content is not enough to ensure scalability. User requests need to be balanced over multiple machines. To be dynamic, information addressing must follow load balancing. Load balancing has focused on the pull model, but performance in mobile computing may be as easily gated by the push model.

When a caching proxy retrieves a file from the content server, it can store a copy. If another request for the same file comes in, the caching proxy has it available and does not need to retrieve the file from the server again. Structuring your environment to use load-balancing and caching proxies in conjunction with runtime content adaptation can help greatly improve performance, not only on retrieval but in the transformation phases as well.

Both WebSphere Everyplace Gateway and WebSphere Edge Server are complementary products to WebSphere Everyplace Access and can be incorporated into the overall mobile enterprise solution.

### Managing diverse content

The primary consideration for content generation is where and how to tailor content to the user. Transformations are computing-intensive operations. To overcome this issue, it's important to maximize use of intelligent caching of information in the overall design. Creating multiple content representations for multiple devices can be a time-consuming management and maintenance task. WebSphere Everyplace Access accommodates these choices and considerations without having to reengineer the solution as it grows and evolves. The mobile business application design must consider how many device types it will support and the capabilities and characteristics of each device. Therefore, the ability to transform content on the fly may be a necessity. And the number of applications will inevitably increase as mobile business becomes your application model.

### Considerations for client devices

The existing enterprise application paradigm supports clients (devices) that are connected to an enterprise server. This paradigm has worked well on fixed networks with fixed clients. Now, however, a new paradigm has emerged because mobile devices may or may not be connected to a fixed or wireless network during their usage cycles. Enterprise usage scenarios demand that these devices connect to the server to obtain needed data, but then they must continue to function while disconnected from the server. To make these devices support connected and disconnected operations, application models have emerged that provide a browser model (thin client) and a standalone model (rich client). This application model allows the device to perform meaningful functions while detached from the host.

Choosing an application for a client device is a complex decision, often based on more than just the technical capabilities of the device. The developer needs to analyze usage requirements as well. The application design must be able to browse and, in realtime, interact with data stored on a server; or send the information to a device for use locally, synchronizing the updates with the server later. Many applications will continue to require timely access to server-resident information and are ideally suited to browser-based, thin-client solutions. Devices that can use always-on types of networks, such as wire line Digital Subscriber Line (DSL) or wireless GPRS, help ensure that this can be easily extended to push notification models.

A wide variety of device operating systems is available, including Microsoft Windows®, Linux®, Microsoft Windows CE, Microsoft Pocket PC, Epoc, Palm and various embedded operating systems. These device environments are in competition, and a clear winner has not been established. Java Virtual Machine (JVM) promises a device-agnostic approach, touting a run-anywhere theme, but JVMs are still too large for many less-capable devices.

Programming models for both rich and thin clients need to be accommodated. Clearly there is a demand to merge them into one unified model. This is not possible without extensions to existing models and supporting software to enable this. WebSphere Everyplace Access establishes an open application model that supports both rich- and thin-client architectures. In the initial release of WebSphere Everyplace Access, the client has various capabilities that allow both connected and disconnected usage. One promising direction is the capability which extends the Web model to allow the mobile worker to work offline. This provides the benefit of enhancing the skills of the vast number of Web programmers. New mechanisms—along with Java technology-based and JSP and bean technologies—could be used as part of this new unified approach.

### **Extending enterprise assets to a mobile environment**

Each enterprise must determine its unique timetable for mobilizing the enterprise. Some key steps to help you prepare are:

- *Create an enterprise mobilization strategy.*
- *Determine the appropriate infrastructure.*
- *Understand user needs and create the right user experience.*
- *Provide tools and skill-building to your development team.*
- *Address security considerations.*

### Create an enterprise mobilization strategy

An enterprise mobilization strategy determines how to capitalize on mobilizing your enterprise assets. The first step in creating a strategy is assessing the value of mobilization and determining the return on investment potential. Asking questions like:

- *Can mobile solutions help give me a competitive advantage?*
- *Can mobile solutions help reduce my costs or improve my business processes?*
- *Can mobile solutions help improve productivity? If so how and where?*
- *Can mobile solutions help improve revenue or increase customer loyalty?*
- *How and where within the company can mobile solutions help provide a return on my investment?*

Another set of questions that may help you identify the opportunity for this technology is:

- *How can mobile solutions keep my employees productive and engaged?*
- *What worker activities can be improved with mobile solutions?*
- *How can mobile solutions maximize the value of my workers' time?*
- *Can manual tasks or paperwork be automated using a mobile solution?*
- *How much more effective would my mobile workers be if they could stay connected to office services, business applications and data?*

These questions can help to move your enterprise beyond the excitement of new technology to the reality of determining how and where it can benefit your organization. Once you have completed this exercise, you have the foundation for an enterprise mobilization strategy. This strategy should include your short-term and long-term goals with the technology, your investment plan, the target enterprise assets and your roll-out plan. Be sure to include an assessment of the various tasks that mobile workers perform and which tasks could benefit from this technology. An initial determination of how best to service your mobile workers is part of this assessment and part of the continuing analysis process. The user analysis should characterize the device, software and application requirements. Providing a comprehensive strategy is key to incorporating any new technology into your enterprise and is important to making the right decisions about the technology.

#### **Determine the appropriate infrastructure**

Unless you are in the business of creating middleware, your best bet is to develop a business relationship with a software provider that specializes in mobile computing. This paper has discussed many of the key requirements for enterprise mobile computing application software. WebSphere Everyplace Access is a very compelling and comprehensive product. The best approach to exploring a new technology is to start small with a pilot project and grow your solution and expertise. WebSphere Everyplace Access supports this approach by allowing you to start small, at a low entry cost, and incrementally extend access to your enterprise. Mobilizing e-mail and PIM applications is one place to start and can help you see an immediate return on investment.

#### **Understand user needs and create the right user experience**

The best way to successfully introduce new software or hardware into the mobile work force is by making sure that the technology fits the needs and work styles of mobile users. The technology must be user friendly while providing the services they need. These considerations must include the type of devices selected, the applications involved, the degree of integration and, ultimately, the value to the user. You may also want to invest in syndicated services to bolster the interest, value and acceptance of the technology.

#### **Provide tools and skill building to your development team**

Your development team is crucial to carrying out your enterprise mobilization strategy, and it must be armed with the tools, skills and technology to make the strategy a reality. Your development team understands and manages your existing corporate assets. What could be a better resource for this undertaking? To increase the effectiveness of your developers, be sure to select tools that complement their existing skills, extend their skills in a developer-friendly way and provide applicable samples to use as a base for their development tasks. All in all, outfitting your developers with an integrated development, test and deployment environment and linking the tools to a robust infrastructure is essential to their success. WebSphere Studio and the Everyplace Toolkit support your developers by providing an integrated development environment that encompasses all aspects of the development process including the creation, testing, debugging and deployment of their applications to a production environment.

### Address security considerations

Security is often left as an afterthought in many IT projects. However, it is imperative to make security a main focus within the development team and for executive sponsors because security breaches can occur when opening the enterprise to outside access. Device security and enterprise security must be included from the outset in the overall design and strategy. Not doing so can cause your external Web site to have a delayed launch.

Security is a fundamental aspect of the WebSphere Everyplace Access architecture. Both the WebSphere Portal framework and WebSphere Application Server have tight security features. If you have a security package that you are comfortable with, however, WebSphere Everyplace Access supports an authentication proxy, which allows you to use your security package.

### Summary

WebSphere Everyplace Access is based on an open architecture that can allow products from other vendors to interact with IBM software. By doing so, IBM provides its Business Partners with the opportunity to integrate their tools and technology with its tools to offer optimal solutions possible. IBM realizes that breadth of technology is more than any one company can provide so it actively pursues relationships with companies whose products are complementary, and it remains open to interest from other parties. After all, the goal is to have a satisfied customer and repeat business.

This white paper has addressed many of the key concerns in mobilizing your enterprise. It introduced you to WebSphere Everyplace Access and showed you how to create and execute your enterprise mobilization strategy. IBM is ready and able to help you mobilize your enterprise and to take advantage of this technology. This technology is valuable to your organization, to your workers and to your competitive advantage. Start now and act quickly to seize the competitive advantage.

**For more information**

To learn more about IBM pervasive computing and WebSphere Everyplace Access, visit:  
developer.**ibm.com**/pvc.

This Web site contains a comprehensive online curriculum designed to help you understand the opportunities and challenges of extending your e-business to a wireless e-business. The curriculum includes Web-based lectures, IBM Business Partner workshops and hands-on classes.

Or, you can contact us by phone at 800-Talk2-Me or by e-mail at Talk2Me@us.ibm.com.

To learn more about Eclipse products, visit:  
[www.eclipse.org](http://www.eclipse.org).





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